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EXAMINER

FARROKH, HASHEM

ART UNIT PAPER NUMBER

2187

DATE MAILED: 02/04/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application N .

09/851,452

Applicant(s)

CHIU ET AL.

Examiner

Hashem Farrokh

Art Unit

2187

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 10 November 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,5-10,12-13,16-21,23-24 and 27-32 is/are rejected.
- 7) ☒ Claim(s) 3,4,11,14,15,22,25,26 and 33 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

Claim Rejections - 35 USC § 103

This Office Action is in response to the Applicant's remarks dated 11/10/04. Claims 1, 12, and 23 are amended. No claim is added or canceled. There are a total of 33 claims pending in the application

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 5-7, 12-13, 16-18, 23-24, and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,787,470 to DeSimone et al (hereinafter DeSimone) in view of U.S. Patent No. 6,073,218 to DeKoning et al. (hereinafter DeKoning).

1. *In regard to claim 1, DeSimone teaches:*

"A method of maintaining cache (e.g., see column 4, lines 55-56; column 5, lines 33-34) in a clustered environment," (e.g., see column 1, line 48; elements 101-102 in Fig. 1). For example Fig. 1 shows a plurality of client terminals (cluster). "comprising:" "storing the modified data in cache of the primary node" (e.g., see column 10, lines 47-48). For example first Web cache is the primary cache.

"selecting a secondary node for storing the modified data in the secondary node's cache", (e.g., see column 10, lines 52-54) "based on a historic point of access list

maintained in a cache directory”, (e.g., see column 6 lines 46-54; column 7 lines 24-30). For example the state information maintained as a table represents the directory that includes the modification time (e.g., historic point of access).

“wherein the historic point of access identifies which node’s cache contains which data;” (e.g., see column 5 lines 63-67; column 10 lines 54-58). For example the second cache maintains state information regarding WEB objects (e.g., data) in the second cache and all other caches.

“forwarding the modified data and symbolic information to one or more relevant nodes in the storage cluster,” (e.g., see column 4 lines 25-26; column 10 lines 54-58).

“wherein the symbolic information identifies the primary and secondary nodes as containing the modified data; and” (e.g., see column 6 lines 46-54; column 10 lines 54-58). For example the URL for identifying the objects and caches are symbolic information.

“updating the historic point of access list based on the symbolic information” (e.g., see column 6 lines 8-11 and 46-54; column 10 lines 43-49). However, DeSimone does not expressly teach: “receiving an I/O request for modifying data in a primary node of a storage cluster of two or more nodes;”

DeKoning teaches: “receiving an I/O request (e.g., see column 19 lines 42-43) for modifying data in a primary node (e.g., see column 19 lines 49-50) of a storage cluster of two or more nodes;” (e.g., see column 3 lines 22-31; Fig. 1) for updating the cache in the primary controller node of RAID storage system. Therefore, It would have been obvious to the one having ordinary skill in the art at the time the invention was

made to include the I/O operation taught by DeKoning to the inter-cache protocol of DeSimone, since the inclusion would provide capability that updates (modifies) the cache memories distributed among plurality of controllers (see column 19, lines 50-51).

2. *In regard to claim 12, DeSimone teaches:*

"An apparatus for maintaining (e.g., see column 4, lines 55-56; column 5, lines 33-34) in a clustered environment," (e.g., see column 9, lines 1-2). For example a plurality of WEB servers (cluster) connected on the packet data network. "comprising:"

"(a) a cache;" (e.g., see column 3, lines 36,38; elements 103 and 107 in Fog. 1).

"(b) a cache directory comprising a historic point of access list for the cache;" (e.g., see column 6 lines 46-54; column 7 lines 24-30). For example the state information maintained as a table represents the directory that includes the modification time (e.g., historic point of access).

"wherein the historic point of access identifies which node's cache contains which data;" (e.g., see column 5 lines 63-67; column 10 lines 54-58). For example the second cache maintains state information regarding WEB objects (e.g., data) in the second cache and all other caches.

"store the modified data in the cache of storage node;" (e.g., see column 10, lines 47-48). For example Web caches contain the modified data.

"(ii) select a secondary node for storing data in the secondary node's cache (e.g., see column 10, lines 52-54) based on the historic point of access list;" (e.g., see column

6, lines 46-54; column 7 lines 24-30). *For example the state information maintained as a table represents the directory that includes the modification time (e.g., historic point of access).*

“(iii) forward the modified data and symbolic information to one or more additional storage nodes in the storage cluster;” **(e.g., see column 4 lines 26; column 10 lines 54-58).**

“wherein the symbolic information identifies a primary node and the secondary node as containing modified data” **(e.g., see column 6 lines 46-54; column 10 lines 54-58).**
For example the second cache maintains state information regarding WEB objects (e.g., data) in the second cache and all other caches.

“and (iv) update the historic point of access list based on the symbolic information.”
(e.g., see column 6 lines 8-11 and 46-54; column 10 lines 43-49). *For example the message-processing unit renews (updates) the access strategy table.*

“wherein the storage node maintains cache and the cache directory,” **(e.g., see column 5 lines 63-66).** *For example each WEB server has at least a cache and cache table (or directory). However, DeSimone does not expressly teach: “and wherein the storage node is configured to: (i) receive an I/O request for modifying data; (c) a storage node organized in a storage cluster and having an interface for connecting to a host, (c) a storage node organized in a storage cluster and having an interface for connecting to a host, a storage disk, and one or more additional storage nodes,”*

DeKoning teaches: "(c) a storage node organized in a storage cluster (e.g., see column 3 lines 24-30), and having an interface for connecting to a host," (e.g., see elements 120, 154, and 118.1 in Fig. 1).

"a storage disk (e.g., see elements 110 in Fig. 1), and one or more additional storage nodes," (e.g., see element 118.2 in Fig. 1).

"and wherein the storage node (element 118.1 in Fig. 1) is configured to:"

"(i) receive an I/O request for modifying data;" (e.g., see column 19 lines 43-51) for updating the cache in the primary controller node of RAID storage system. Therefore, it would have been obvious to the one having ordinary skill in the art at the time the invention was made to include the I/O operation taught by DeKoning to the inter-cache protocol of DeSimone, since the inclusion would provide capability that updates (modifies) the cache memories distributed among plurality of controllers (see column 19, lines 50-51).

3. *In regard to claim 23, DeSimone teaches:*

"An article of manufacture, embodying logic to perform a method of maintaining cache in a clustered environment," (e.g., see column 1 lines 47-61; column 5, lines 33-34; Fig. 1).

"the method comprising:"

"storing the modified data in the primary node;" (e.g., see column 10, lines 47-48). For example first Web cache is the primary cache.

“selecting a secondary node for storing the modified data in the secondary node’s cache (e.g., see column 10, lines 52-54) based on a historic point of access list maintained in a cache directory;” (e.g., see column 6, lines 46-54; column 7 lines 24-30). *For example the state information maintained as a table represents the directory that includes the modification time (e.g., historic point of access).*

“wherein the historic point of access list identifies which node’s cache contains which data;” (e.g., see column 5 lines 63-67; column 10 lines 54-58). *For example the second cache maintains state information regarding WEB objects (e.g., data) in the second cache and all other caches.*

“forwarding the modified data and symbolic information to one or more relevant nodes in the storage cluster;” (e.g., see column 4 lines 25-26; column 10 lines 54-58).

“wherein the symbolic information identifies the primary and secondary nodes as containing the modified data; and” (e.g., see column 6 lines 46-54; column 10 lines 54-58). *For example the URL for identifying the objects and caches are symbolic information.*

“and updating the historic point of access list based on the symbolic information.” (e.g., see column 6 lines 8-11 and 46-54; column 10 lines 43-49).

DeKoning teaches: “receiving an I/O request (e.g., see column 19 lines 42-43), for modifying data (e.g., see column 19 lines 49-50), in a primary node of a storage cluster of two or more nodes;” (e.g., see column 3 lines 22-31; Fig. 1) for updating the cache in the primary controller node of RAID storage system. Therefore, It would have

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been obvious to the one having ordinary skill in the art at the time the invention was made to include the I/O operation taught by DeKoning to the inter-cache protocol of DeSimone, since the inclusion would provide capability that updates (modifies) the cache memories distributed among plurality of controllers (see column 19, lines 50-51).

4. *In regard to claims 2, 13, and 24 DeKoning teaches:*

"wherein the request is to write data." (e.g., see column 4 lines 3 and 17) for performing an exclusive Write operation. Therefore, It would have been obvious to the one having ordinary skill in the art at the time the invention was made to include the exclusive write operation taught by DeKoning to the inter-cache protocol of DeSimone, since the inclusion would provide capability that prevents other controller to write to the same portion of the shared storage area at the same time (see column 4, lines 11-25).

5. *In regard to claim 5, 16 and 27 DeSimone teaches:*

"the symbolic information includes information relating to the first node;" (e.g., see column 6, lines 46-54; column 10 lines 54-56). For example URLs are symbolic information that is relating the first WEB cache (e.g., the first node).

"and the historic point of access list is updated by;" (e.g., see column 6, lines 8-11 and 46-54; column 10 lines 43-50). For example state-information table which includes the times when cache's objects modified represents the historic point of access list.

"listing the first node as the primary node;" (e.g., see column 6, lines 46-54; column 10 lines 54-56). For example the node containing the first Web cache represents the primary node.

"and listing the secondary node as the secondary node." (e.g., see column 6, lines 46-54; column 10 lines 54-56). For example the node containing the second Web cache represents the secondary node.

6. In regard to claim 6, 17, and 28 DeSimone teaches:

"selecting a remote node that is an original secondary node in the historic point of access list maintained in the cache directory." (e.g., see column 6, lines 46-54; column 10 lines 54-56). The entries state-information table (directory) has the format (url_i, t_i, c_i) . The c_i identify any WEB cache i along with the time of its modification's t_i . The remote universal locator url_i selects the WEB cache i , which includes the original second WEB cache (e.g., original secondary node).

7. In regard to claim 7, 18, and 29 DeSimone teaches:

"a copy of the modified data is maintained in the first node and the secondary node;" (e.g., see column 9 lines 17-19). For example the first Web cache (e.g. first node) and second Web cache (e.g. second) maintain the same copy.

"and the symbolic information is maintained in remaining nodes of the storage cluster." (e.g., see column 5, lines 32-35; column 6 lines 46-54). For example all caches maintain the state-information, which has URL or symbolic representation.

Claims 8, 19, and 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeSimone in view of DeKoning as applied to claims 1, 12, and 23 above, and further in view of U. S. Patent No 6,178,519 B1 to Tucker.

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8. *In regard to claim 8, 19, and 30 DeSimone in view of DeKoning teaches all limitations of independent claims that these claims depend on, but does not teach: "acquiring a lock on associated tracks on nodes in the storage cluster wherein the locking protocol provides for multiple readers and a single writer."*

Tucker teaches: "acquiring a lock on associated tracks on nodes in the storage cluster wherein the locking protocol provides for multiple readers and a single writer." (e.g., see column 6 lines 59-65) for purpose of having single write and multiple read into the shared memory. Therefore it would have been obvious to one having ordinary skill in art at the time the invention was made to include locking policy taught by Tucker to the combined teaching of DeSimone and DeKoning, since inclusion provide a locking policy that allows a single write and multiple reads to the shared memory at a given time (e.g. column 6 lines 61-62).

Claims 9, 20, and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeSimone in view of DeKoning as applied to claims 1, 12, AND 23 above, and further in view of U.S. Patent No. 6,182,111 B1 to Inohara et al. (hereinafter Inohara) and U.S. Patent No. 6,035,415 to Fleming.

9. *In regard to claim 9, 20, and 31,*

DeSimone in view of DeKoning teaches all limitations of independent claims that these claims depend on, but does not teach: "replicating the data from the primary node or the secondary node to another node in the storage cluster; detecting a failure of a node in

the storage cluster; broadcasting a failover recovery message to all nodes in the storage cluster.”

Inohara teaches: “replicating the data from the primary node or the secondary node to another node in the storage cluster.” (e.g., see column 2 lines 27-30) for copying (or replicating) the news (e.g., data) from second server (e.g., secondary node) to another server (e.g., another node). Therefore it would have been obvious to one having ordinary skill in art at the time the invention was made to include copying method taught by Inohara to the combined teaching of DeSimone and DeKoning, since the inclusion would provide capability of having the same information in plurality of sites in order to access the information in high speed or increase the possibility of accessibility (e.g. column 1 lines 27-31).

Fleming teaches: “detecting a failure of a node in the storage cluster;” (e.g., see column 13 line 33) for purpose of detecting a failure. Therefore it would have been obvious to one having ordinary skill in art at the time the invention was made to include failure detection mechanism taught by Fleming to the combined teaching of DeSimone and DeKoning, since inclusion causes the secondary unit to take over the role of the failed primary unit (e.g. column 13 lines 37-39).

“broadcasting a failover recovery message to all nodes in the storage cluster.” (e.g., see column 12 lines 31-36) for purpose adding failover control block (circuitry). Therefore it would have been obvious to one having ordinary skill in art at the time the invention was made to include failover control block taught by Fleming to the combined teaching of

DeSimone and DeKoning, since inclusion provides the capability to outputting (broadcasting) the failover recovery messages (e.g. column 12 lines 34-36).

Claims 10, 21, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over DeSimone in view of DeKoning as applied to claims 1, 12, AND 23 above, and further in view of Fleming and U.S Patent No. 5,768,623 to Judd et al. (hereinafter Judd).

10. *In regard to claims 10, 21, and 32, DeSimone in view of DeKoning teaches all limitations of independent claims that these claims depend on, but does not teach: "detecting a failure of a node in the storage cluster; broadcasting a failover recovery message to all nodes in the storage cluster; and destaging the data from the primary node or the secondary node to disk."*

Fleming teaches: "detecting a failure of a node in the storage cluster;" (e.g., see column 13 line 33) for purpose of detecting a failure. Therefore it would have been obvious to one having ordinary skill in art at the time the invention was made to include failure detection mechanism taught by Fleming to the combined teaching of DeSimone and DeKoning, since inclusion causes the secondary unit to take over the role of the failed primary unit (e.g. column 13 lines 37-39).

"broadcasting a failover recovery message to all nodes in the storage cluster;" (e.g., see column 12 lines 31-36) for purpose adding failover control block (circuitry). Therefore it would have been obvious to one having ordinary skill in art at the time the invention was

made to include failover control block taught by Fleming to the combined teaching of DeSimone and DeKoning, since the inclusion provides the capability to outputting (broadcasting) the failover recovery messages (e.g. column 12 lines 34-36).

Judd teaches: "and destaging the data from the primary node or the secondary node to disk." (e.g., see column 10 lines 16-17) for purpose of destaging data to disk. Therefore it would have been obvious to one having ordinary skill in art at the time the invention was made to include destaging data (e.g. copying data from the cache to the disk) taught by Fleming to the combined teaching of DeSimone and DeKoning, since the inclusion provide the capability to protect the availability of data stored in storage systems (e.g. column 1 lines 26-29).

ALLOWABLE SUBJECT MATTER

Claims 3, 4, 11, 14-15, 22, 25-26 and 33 are objected to as being dependent upon rejected based claims, but would be allowable if rewritten in correct and independent form including all of the limitations of the base claim and any intervening claims.

- 1. The primary reason for allowance of claims 3, 14, and 25 in instant application is the combination with the inclusion in these claims having the the historic point of access indicates that data is not currently in cache of any node of storage cluster.*
- 2. The primary reason for allowance of claims 4, 15, and 26 in instant application is the combination with the inclusion in these claims having the secondary node selected is the original primary node.*

2. *The primary reason for allowance of claims 11, 22, and 33 in instant application is the combination with the inclusion in these claims having requesting a modified track list comprising an identifier of modified data and an associated symbolic entry.*

: IMPORTANT NOTE :

If the applicant should choose to rewrite the independent claims to include the limitations recited in either one of the claims, the applicant is encouraged to amend the title of the invention such that it is descriptive of the invention as claimed as required by sec. 606.01 of the MPEP. Furthermore, the summary of invention and the abstract should be amended to bring them into harmony with the allowed claims as required by paragraph 2 of sec. 1302.01 of the MPEP.

As allowable subject matter has been indicated, applicant's response must either comply with all formal requirements or specifically traverse each requirement not complied with. See 37 C.F.R. § 1.111(b) and § 707.07(a) of the M.P.E.P.

Response to Applicant's Remark

This Office Action is response to the Applicant's remarks dated 11/10/04. The Applicant objects the reasons for rejected claims as follows (see page 10 of the Applicant's remarks):

(1) Inohara fails to teach, disclose or suggest modifying data and storing the modifies data in cache;

(2) Inohara fails to teach, disclose, or suggest storing the modified data in the cache of multiple nodes; and

(3) Inohara fails to teach, disclose, or suggest transmitting symbolic information to other nodes in the cluster.

The Applicant, then, has amended the original independent claims to include the above items.

The Examiner respectfully disagrees with the Applicant's assessment of Inohara teaching in regards to original claims or the above Applicant's arguments. First, in regard to items (1) and (2), Inohara teaches: "the same information is temporarily copied to a plurality of sites in order to access the information at high speed or increase a possibility of accessibility. Such a copy is discriminably called hint, cache, replica, stash and the like" (e.g. column 1 lines 27-31). This indicates (emphasizes added) that the same information (new, updated or modified) copied and stored to all nodes and cached.

In regard to item (3) above, Inohara teaches:

"DNS has a correspondence mainly between a symbolic host name and host related information (IP address and mail address). A plurality of DNS servers has a tree structure. A request from a client is processed by tracing the tree structure and transferring the request to a plurality of servers." (Inohara: column 2, lines 36-41).

"In this case, a host URL message 124 indicating an addition of the first URL contents is transmitted to some or all of the other servers 205', 205", . . . of the present system." (Inohara: column 9, lines 57-60).

Both DNS and URL use symbolic names to transmit information.

However, in order to clarify and overcome the Applicant's objection and new limitations added to the amended claims, additional prior art references are being used in this Office Action. Accordingly, this Office Action has been made final

Conclusion

This action is made final. Applicant is reminded of the extension of time policy as set in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTH from the mailing date of this final action.

Any inquiry concerning this communication should be directed to Hashem Farrokh whose telephone number is (571) 272-4193. The examiner can normally be reached Monday-Friday from 8:00 AM to 5:00 PM.

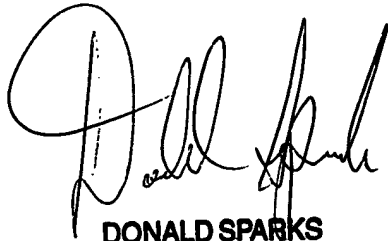
If attempt to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Donald A Sparks, can be reached on (571) 272-4201.

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Any inquiry of a general nature or relating status of this application or proceeding should be directed to the central telephone number (571) 272-2100.

HF.
HF

2005-01-26


DONALD SPARKS
SUPERVISORY PATENT EXAMINER